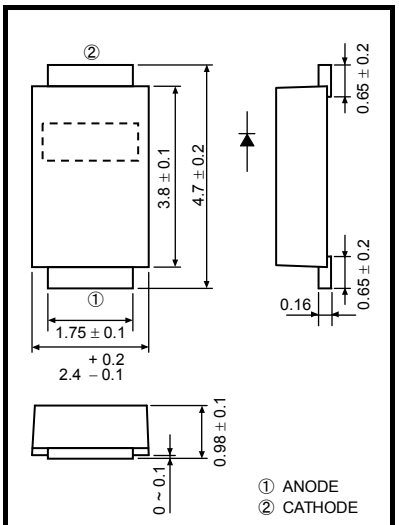
TOSHIBA Fast Recovery Diode Silicon Diffused Type

CMF05

High-Speed Rectifier Applications (Fast Recovery)
Switching Mode Power Supply Applications
DC-DC Converter Applications

- Repetitive peak reverse voltage: V_{RRM} = 1000 V
- Average forward current: $I_{F\ (AV)}$ = 0.5 A
- Forward voltage: V_{FM} = 2.7 V (max)
- Very fast reverse-recovery time: t_{rr} = 100 ns (max)
- Suitable for compact assembly due to the use of a small surface-mount package“ M−FLAT™” (Toshiba package name)

Unit: mm



JEDEC	―
JEITA	―
TOSHIBA	3-4E1A

Weight: 0.023 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Repetitive peak reverse voltage	V_{RRM}	1000	V
Average forward current	$I_{F\ (AV)}$	0.5 (Note 1)	A
Peak one-cycle surge forward current (non-repetitive)	I_{FSM}	10 (50 Hz) (Note 2)	A
Junction temperature	T_j	−40 to 125	°C
Storage temperature range	T_{stg}	−40 to 150	°C

Note 1: T_ℓ = 92°C
Rectangular waveform (α = 180°)

Note 2: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook (“Handling Precautions”/ “Derating Concept and Methods”) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Electrical Characteristics (Ta = 25°C)

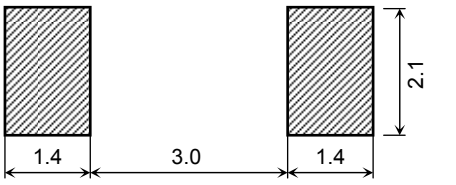
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Peak forward voltage	V_{FM}	I_{FM} = 0.5 A (pulse test)	—	—	2.7	V
Repetitive peak reverse current	I_{RRM}	V_{RRM} = 800 V (pulse test)	—	—	50	μA
Reverse recovery time	t_{rr}	I_F = 1 A, di/dt = −30 A/μs	—	—	100	ns
Forward recovery time	t_{fr}	I_F = 1 A	—	550	—	ns
Thermal resistance	$R_{th\ (j\text{-}a)}$	Device mounted on a ceramic board (board size: 50 mm × 50 mm) (soldering land: 2 mm × 2 mm) (board thickness: 0.64 mm)	—	—	60	°C/W
		Device mounted on a glass-epoxy board (board size: 50 mm × 50 mm) (soldering land: 6 mm × 6 mm) (board thickness: 1.6 mm)	—	—	135	
		Device mounted on a glass-epoxy board (board size: 50 mm × 50 mm) (soldering land: 2.1 mm × 1.4 mm) (board thickness: 1.6 mm)	—	—	210	
Thermal resistance (junction to lead)	$R_{th\ (j\text{-}\ell)}$	—	—	—	16	°C/W

Marking

Abbreviation Code	Part No.
F5	CMF05

Standard Soldering Pad

Unit: mm



Handling Precautions

1) The absolute maximum ratings of a semiconductor device are a set of ratings that must not be exceeded, even for a moment. Do not exceed any of these ratings.
   The following are the general derating methods we recommend for designing a circuit using this device.

V_{RRM}: We recommend that the worst-case voltage, including surge voltage, be no greater than 80% of the absolute maximum rating of V_{RRM} for a DC circuit; and no greater than 50% of that of V_{RRM} for an AC circuit.
V_{RRM} has a temperature coefficient (0.1%/°C). Be sure to take this temperature coefficient into account when designing a device for use at low temperature.

$I_{F(AV)}$: We recommend that the worst case current be no greater than 80% of the absolute maximum rating of $I_{F(AV)}$. Carry out sufficient heat design. If it is not possible to design a circuit with excellent heat radiation, set a margin by using an allowable Ta max-$I_{F(AV)}$ curve.

I_{FSM}: This rating specifies the non-repetitive peak current. This is only applied for an abnormal operation, which seldom occurs during the lifespan of the device.

T_j: Derate this rating when using a device in order to ensure high reliability. We recommend that the device be used at a T_j of below 100°C.

2) Thermal resistance between junction and ambient fluctuates depending on the mounting condition of the device. When using the device, be sure to design the circuit board and soldering land size to match the appropriate thermal resistance value.

Refer to the Rectifier databook for further information.

3) Moisture-Proof Packing

The CMF05 is packed in a moisture-proof laminated aluminum bag.

Precautions for Transportation and Storage

(1) Avoid excessive vibration during transportation.
(2) Do not toss or drop the packed devices to avoid ripping of the bag.
(3) After opening the moisture-proof bag, the devices should be stored at a temperature of 5°C to 30°C and at an RH of 70% or below. The devices should be assembled within the defined period.

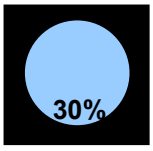
Reflow Soldering Conditions:

First reflow soldering:	Within 120 hours after opening the moisture-proof bag
Second reflow soldering:	Within 72 hours after the first reflow soldering
Third reflow soldering:	Within 72 hours after the second reflow soldering

Flow Soldering Conditions:

Perform flow soldering within 120 hours after opening the moisture-proof bag. Flow soldering is permitted at most once.
Preheat the devices for 60 to 120 seconds at a temperature of 150°C.

(4) The moisture-proof bag may be stored unopened for up to 12 months at 5°C to 30°C at an RH of 90% or below. If, upon opening the bag, the moisture indicator card shows humidity of 30% or above (the color of the 30% dot has changed from blue to pink) or the expiration date has passed, the devices should be baked as follows:
Baking conditions: 60°C ± 5°C for 24 to 36 hours. Perform baking at most once.
Repeated baking can cause the peeling strength of the tape to change and lead to an assembly problem.
Furthermore, countermeasures against static electricity should be taken during baking.



The humidity indicator shows an approximate ambient humidity at 25°C.
If the ambient humidity is below 10%, the color of all the indicator dots is blue.
If, upon opening the bag, the color of the 30% dot has changed from blue to pink, the devices should be baked before assembly.

4) Mounting Method

・Using Infrared Reflow

(1) Heating the top and bottom with long or medium infrared rays is recommended (see Figure 1).

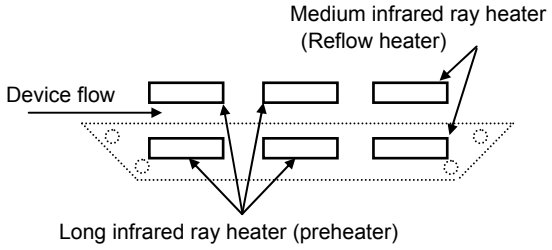


Figure 1 Heating the top and bottom with long or medium infrared rays

(2) Complete the infrared ray reflow process within 30 to 50 seconds when a package surface temperature is 230°C or higher. The maximum package surface temperature should be kept below 260°C.

(3) Figure 2 shows an example of temperature profile.

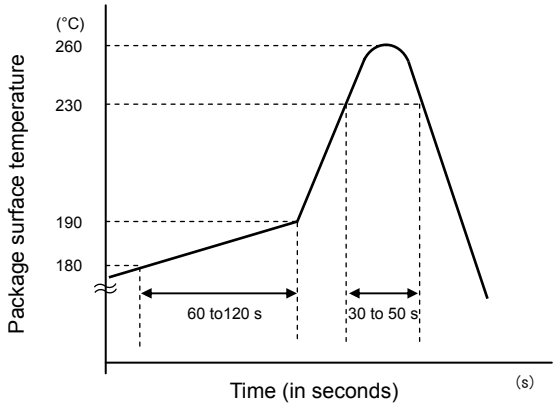


Figure 2 Example of Temperature Profile

This profile is based on the device's maximum guaranteed heat resistance.
Optimize the preheat and heating temperatures according to the type of solder paste used. The above profile should be not exceeded.

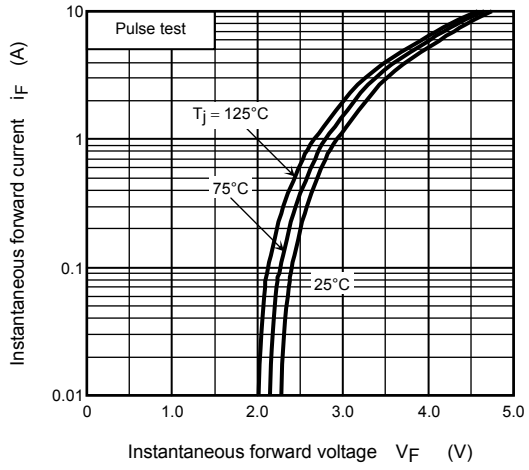
(4) Using Hot Air Reflow Soldering

(1) Complete hot air reflow process within 30 to 50 seconds when a package surface temperature is 230°C or higher. The maximum package surface temperature should be kept below 260°C.
(2) Figure 2 shows an example of temperature profile.

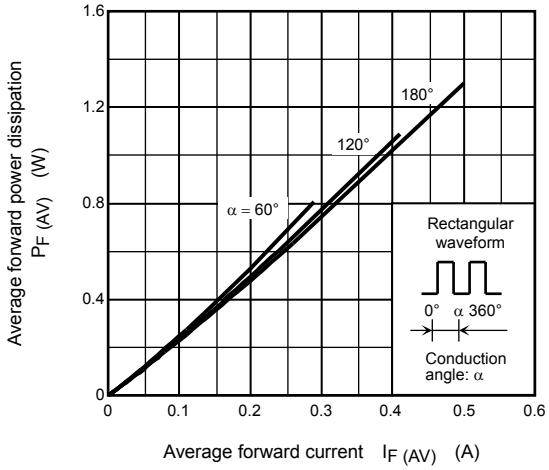
(5) Using Flow or Dip Soldering

(1) Preheat the devices for 60 to 120 seconds at a temperature of 150°C.
(2) Complete soldering within ten seconds below 260°C. Flow or dip soldering is permitted at most once.

$i_F - v_F$

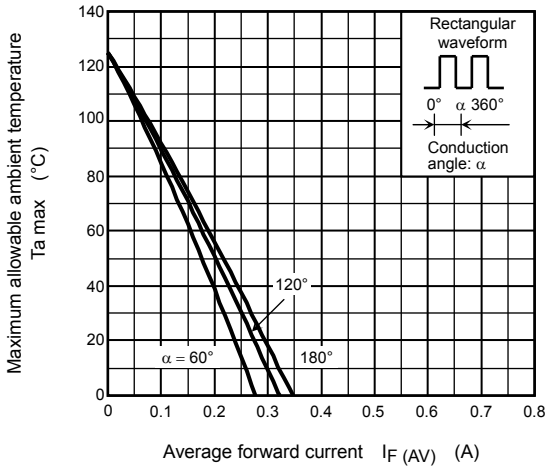


$P_{F\ (AV)} - I_{F\ (AV)}$

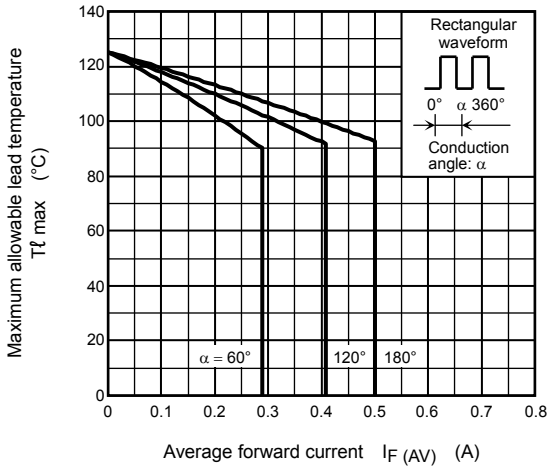


T_a max – $I_{F\ (AV)}$

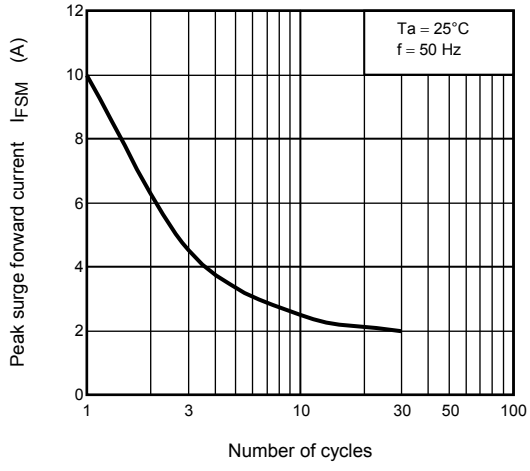
Device mounted on a glass-epoxy board
(board size: 50 mm × 50 mm, land size: 6 mm × 6 mm)



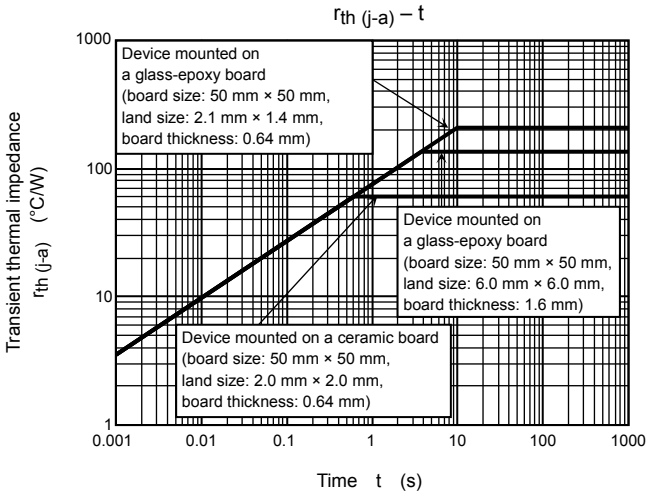
T_ℓ max – $I_{F\ (AV)}$



Surge forward current
(non-repetitive)



$r_{th\ (j\text{-}a)} - t$



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